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*Date of Application, 8th Nov., 1900*

*Complete Specification Left, 29th July, 1901—Accepted, 19th Oct., 1901*

PROVISIONAL SPECIFICATION.

**“Improvements in or relating to Machines for the Manufacture of Bottle Capsules.”**

I, ADOLF FIEDLER, Manufacturer of Komotau, in Bohemia do hereby declare the nature of this invention to be as follows:—

5 The machines as used at present in the manufacture of bottle capsules consist essentially of a support adjustably arranged so as to correspond to the shape of the capsule to be formed and provided with a roller which by its automatic forward movement shapes a cap placed on a spindle or mantle, so as to form the capsule desired. After accomplishing the object in view the support with its roller recedes to its initial position, while the capsule is pushed off the spindle by a sleeve pressed forward by a spring.

10 Such machines suffer from the drawback that the roller is fixedly arranged and that the support has to be adjusted according to the shape of the capsule it is intended to produce.

15 The machine forming the object of the present invention differs from other known machines in that the rollers are pressed by spring power against the cap to be shaped into capsule form and that the support is done away with with the view of rendering the working of the machine easier and simpler. The essential features of the present invention are therefore comprised in the mechanism for stretching or shaping the cap, and in an arrangement for automatically actuating that mechanism.

20 The shaping mechanism comprises two discs connected with each other by bars. The rear disc is loosely mounted in a spindle by means of a sleeve. On the front of the other disc are arranged in suitable supports spring controlled rollers in the following manner. The supports in which the roller-holders are mounted and radially displaceable, are keyed on spring controlled rods, the  
25 springs of which tend so as to turn the rods, that the rollers are kept at a distance from the mandrel or spindle arranged in an axial line with the shaft. In order, however to press the rollers in the course of the work against the mandrel or, rather, against the cap placed on it, there are arranged between the said discs bars, one in co-ordination to each of the spring rods, this second series of bars  
30 being axially displaceable.

This displacement is effected by the front part of a clutch coupling device mounted on the operative shaft, which, involves in its forward movement another series of bars terminating in discs or ends which strike against corresponding parts, at the ends of the aforesaid bars. Each of the latter is provided with a  
35 spiral spring between its end and a flanged sleeve, which is embraced by the forked end and of a bell crank lever pivotted in a recess while the other arm of the lever presses against a roller on a spur or projection of the capsule roller support. It will therefore be clear that, when the coupling part is pushed forward the flanged sleeve will also be pushed forward, after the resistance of the spring is  
40 overcome, in consequence of which the bell crank lever will be so turned that, after overcoming the resistance of the spring of the spring controlled rod—the forming rollers will be pressed against the capsule mandrel. The movement of the disc or second coupling member being reversed the bars and with them the bell-crank-levers return to their former position, whereupon the rollers recede

[Price 8d.]



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from the capsule mandrel owing to the corresponding turning of the support bars caused by the expansion, in the opposite direction, of the springs which control them.

For the automatic working of this mechanism a special device is employed. It consists of a stepped pulley by means of which a worm gear can be driven at speeds varying according to requirements, and by means of which the various phases of the work are executed at certain time intervals, with the assistance of intermediate mechanical elements. The worm wheel is loosely arranged on a shaft on which is keyed an arm having at its end an adjustable plate which is caught and held whenever the said arm rises, by a catch or hook pivotted on the frame of the machine. This hook is held by a spring mounted on the pivot pin of the hook in such a position that the plate at the end of the arm can pass above the hooked part after overcoming the tension of the said spring whereupon it is held fast and prevented from moving down again by said hook.

This raising of the lever which, as will be more clearly explained hereafter, is dependent on the movement of another lever, is followed by the turning of the shaft, in consequence of which a crank also keyed on the same shaft and extending upwards into a slot in a support pushes that support forward and in consequence, the spindle carried thereby is pressed against the capsule mandrel, or rather, against the cap placed on it and rotated.

The locking plate of the arm is provided at the end or side opposite the end facing the hook, with a roller rotating on a pin and resting on the said lever pivotted at a point suitably arranged on the frame of the machine. This lever is held in position by a stud pressing against the shaft turning arm and is raised as the worm wheel rotates by a segment screwed to the inner face of the latter, such raising involving also the ascent of the arm until the latter interlocks with the hook. During the upward movement of the lever its stud strikes against the end of a pivotally mounted lever which, thereby indirectly assists in actuating the front part of the clutch coupling of the machine in the following manner:—

The rear part of the coupling is provided at a suitable point with a projection which is connected by means of an articulated joint with one end of a pivotted lever the other end of which is controlled by a spring. This lever is pressed downwards by the forward end of the lever referred to until its other end is caught and locked by a pivotted pawl. This movement of the lever effects the turning of the clutch part of the coupling device which thus becomes instrumental in driving forward the front part, whereby the working position of the capsule forming mechanism is obtained.

It is evident that to form the caps into capsules the mechanism must move forward. For this purpose the nave on which the disc is mounted is carried in a bearing on a longitudinally movable support. The displacement is to take place only after all the operations described have been accomplished, *i.e.* after the shaft support has been pushed forward and the capsule forming mechanism has reached its working position. When all this is done, the pressing or forming rollers and the whole forming mechanism is pushed forward for the purpose of pressing and forming the cap into a capsule. To this end the lower shaft is provided with a loose belt pulley connected by a strap with a stepped pulley. On the nave or boss of the worm wheel is pivotted a two-armed pawl pressed downwards by a spring and pressing with one end against a stud on the pulley.

As the worm wheel rotates, this combination of pawl and stud will involve the belt pulley in the rotatory movement in consequence of which the strap which is fastened to the two pulleys will be tightened until the tension is sufficient to turn the stepped disc or pulley which then effects the forward movement of the sliding support. This effect is obtained by the arrangement of a disc on the machine frame, the disc being connected with the said support or slide by a belt or the like.

After finishing the capsule, the sliding support returns to its initial position in the following manner:—The worm wheel carries a disc fixed on the nave of



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the worm wheel by a disc and provided with a rising track. When the pawl in passing over this track, reaches with its lower end its highest position, the other end of the spring controlled pawl will release the stud of the belt pulley, whereupon the support will be withdrawn by a spring to its initial position.

5 It is evident that the machine may be employed for the production of capsules of any required length and regulating devices are provided for that purpose, which are, however, not essential features as regards the principle of the invention.

10 If, for instance, it is required to produce short capsules, the machine, although otherwise working normally will be allowed to work without effect for such length of time as corresponds to the difference in length between the longer capsules first produced and the shorter ones to be produced.

15 In order to compensate such decrease of output occasioned by the loss of time thus caused, the gearing which actuates the forming mechanism is made to work faster, *i.e.* the driving belt is shifted on to a smaller circumference of the stepped driving pulley. In this manner the various phases of the work effected by the mechanism follow each other more rapidly. It should however be borne in mind that since the speed of the forward movement of the sliding support must always be the same, the strap must be shifted on to a greater diameter of its  
20 stepped pulley. Thus, the speed decided on of the capsule forming mechanism, *i.e.* of the driving stepped pulley must be accompanied by a change in the working diameter of the strap pulley, owing to the conditions which rule the speed of the forward movement of the sliding support.

25 In order to regulate the amount of pressure with which the cap is pressed against the mandrel the locking plate is so fixed on the arm that its inter-locking with the hook can be effected sooner or later according to the requirements of the case in consequence of which the shaft and with it, the crank is turned through an angle which will vary correspondingly. For this purpose the plate is simply moved upwards or downwards, according to the effect desired, for  
30 which purpose it is provided with a slot and set screw, so that by adjusting it the point at which it is locked by the hook can be varied.

From the length of the capsule in each case, depends also the releasing at the required moment, of the pawls or hooks. This is effected by means of adjustable pins. If longer capsules are required, the pin is placed, correspondingly, farther  
35 from the lower end of the pawl; while the release of the hook from the arm is effected by adjusting accordingly its corresponding pin, the latter pressing with its forward end against the sliding support and is moved backwards when the latter recedes in such a manner that the hook releases the adjustable plate on the arm.

40 Provision is also made for drawing the sliding support more or less forward, by causing the strap pulley and with it the stepped pulley to turn through a greater or lesser angle for every turn of the worm-wheel. To do this all that is required is to so adjust the disc on the shaft that the double armed pawl is released at the time required from the stud of the strap pulley. If, for instance,  
45 the disc is turned say towards the right, the ascending track will become farther removed from the rear end of the pawl (considering the direction in which the worm wheel is turning). Since however, the position of the pulley is always the same as regards the relative position of the stud and pawl, it is clear that more time will elapse from the time when the pawl and stud began to co-operate, until  
50 the pawl is released by the passing of the stud over the track

For this turning of the disc a screw threaded rod displaceable relatively as regards the pin is used, which is articulated by means of an arm to the disc.

The working effect of the capsule forming mechanisms and of the device for actuating the same may be briefly described as follows:—

55 In consequence of the movement of the wormwheel device the arm is turned with the shaft in the manner described, by the lever until it is interlocked with the hook. During this time the upper spindle has travelled towards the mandrel



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until it presses against the latter, or rather against the cap placed on it, and set in rotation. The ascent of the lever however, has also been followed by the displacement of the front part of the coupling device and the forming or pressing rollers are pressed against the mandrel. A moment later the pawl comes in contact, as the movement of the wormwheel continues, with the stud of the strap pulley and the sliding support is consequently drawn forward for the purpose of forming the capsule. 5

The return movement to the initial position of the various parts is effected in the reverse order. After the coupling part is pushed backwards in consequence of the pawl striking against the pin whereby the finished capsule is released from the rollers, the other pawl is disengaged from the stud of the strap pulley whereupon the sliding support is free to be drawn back by its spring. At the same time the arm is released from the hook and a spring by turning the shaft, and with it the crank in the reverse direction, returns the support to its initial position. Thereby the upper spindle or shaft is also withdrawn from the mandrel and the finished capsule is thrown off by a sharp forward movement on the said mandrel of a sleeve thereon. 10 15

Finally it may be observed here, that the coupling member is securely guided and prevented from any turning movement by an axial guide device.

Dated this 8th day of November, 1900.

BOULT WADE & KILBURN  
Agents for the Applicant.

## COMPLETE SPECIFICATION.

**“Improvements in or relating to Machines for the Manufacture of Bottle Capsules”.**

I, ADOLF FIEDLER, Manufacturer of Komotau, in Bohemia, do hereby declare the nature of this invention and in what manner the same is to be performed, to be particularly described and ascertained in and by the following statement:—

The machines as used at present in the manufacture of bottle capsules, consist essentially of a support adjustably arranged so as to correspond to the shape of the capsule to be formed and provided with a roller which by its automatic forward movement shapes a cap placed on a spindle or mandrel so as to form the capsule desired. After accomplishing the object in view the support with its roller recedes to its initial position, while the capsule is pushed off the spindle by a sleeve pressed forward by a spring. 30 35

Such machines suffer from the drawback that the roller is fixedly arranged and that the support has to be adjusted according to the shape of the capsule it is intended to produce.

The machine forming the object of the present invention differs from other known machines in that the rollers are pressed by spring power against the cap to be shaped into capsule form and that the support is done away with, with the view of rendering the working of the machine easier and simpler. The essential features of the present invention, are, therefore, comprised in the mechanism for stretching or shaping the cap, and in an arrangement for automatically actuating that mechanism. 40 45

In the accompanying drawings which serve to illustrate the machine under consideration:

Figure 1 is a front view of part of the shaping mechanism.

Figure 2 is an end elevation.

Figure 3 is an elevation of the devices for actuating the shaping mechanism. 50



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Figure 4 is a cross section on the line X, of Figure 3 as seen in the direction of the arrow.

Figure 5 is a plan view of Figure 3,

Figures 6—9 are details,

5 Figure 10 shows the shape of a cap which as shown in Figure 11 is shaped by the machine into the form of a capsule

Figure 12, is a view of the general arrangement of the machine on a reduced scale.

The shaping mechanism comprises two discs *b c* connected with each other by  
10 bars *a*. The rear disc *c* is loosely mounted on a spindle *e* by means of a sleeve *d*. On the front side of the other disc *b* are arranged in suitable supports *f* spring-controlled rollers *g* in the following manner. The supports *f* on which the roller-holders *h* are mounted and radially displaceable are keyed on spring controlled rods *i*, the springs *j* of which tend so to turn the rods *i* that the rollers *g* are kept  
15 at a distance from the mandrel or spindle *k* Figure 12, arranged in an axial line with the shaft. In order, however, to press the rollers *g* in the course of the work, against the mandrel *k* or, rather against the cap placed on it, there are arranged between the said discs *b* and *c* bars *l* one in co-ordination to each of the spring rods *i*, this second series of bars being axially displaceable.

20 This displacement is effected by the front part *m* of a clutch coupling device mounted in the operative shaft, which involves in its forward movement another series of bars *n* terminating in discs or ends *o* which strike against corresponding parts *p*, at the ends of the aforesaid bars *l*. Each of the latter is provided with a spiral spring *v* between its end and a flanged sleeve *q*, which is embraced by  
25 the forked end of a bellcrank lever *s* pivotted in a recess *r* in the front disc *b* while the other arm of the lever presses against a roller *u* on a spur or projection *t* of the capsule roller support *f*. It will therefore be clear that when the coupling part *m* is pushed forward, the flanged sleeve *q* will also be pushed forward, after the resistance of the spring *v* is overcome, in consequence of which the bell-crank  
30 lever *s* will be so turned that, after overcoming the resistance of the spring *j* of the spring controlled rod *i*—the forming rollers *g* will be pressed against the capsule mandrel *k*. The movement of the disc or second coupling member *m* being reversed the bars *l* and with them the bell-crank levers *s* return to their former position whereupon the rollers *g* recede from the capsule device *k* owing  
35 to the corresponding turning of the support bars *i* caused by the expansion, in the opposite direction, of the springs *j* which control them.

For the automatic working of this mechanism a special device as represented in Figures 3, 4 and 5 is employed. It consists of a stepped pulley 1 by means of which a worm gear 2, 3 can be driven at speeds varying according to require-  
40 ments and by means of which the various phases of the work are executed at certain time intervals with the assistance of intermediate mechanical elements. The worm wheel 3 is loosely arranged on a shaft 4 on which is keyed an arm 5 having at its end as represented in Figures 8 and 9 an adjustable plate 6 which is caught and held, whenever the said arm 5 rises, by a catch or hook 7 pivotted  
45 on the frame of the machine. This hook 7 is held by a spring 8 mounted on the pivot pin of the hook in such a position that the plate 6 at the end of the arm 5 can pass upwards above the hooked part after overcoming the tension of the said spring 8 whereupon it is held fast and prevented from moving down again by said hook.

50 This raising of the lever 5 which, as will be more clearly explained hereafter is dependent on the movement of another lever 9 is followed by the turning of the shaft 4, in consequence of which a crank 12 also keyed on the same shaft 4 and extending upwards into a slot 10 in a support 11 pushes that support forward and in consequence, the spindle *e* carried thereby is pressed against the capsule  
55 mandrel *k* or rather against the cap placed on it and rotated.

The locking plate 6 of the arm 5 is provided at the end or side opposite the end facing the hook 7 with a roller 14 rotating on a pin 13 and resting on the said



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lever 9 pivotted on a point 15 suitably arranged on the frame of the machine. This lever 9 is held in position by a stud 16 pressing against the shaft turning arm 5 and is raised as the work wheel 3 rotates by a segment screwed to the inner face of the latter, such raising involving also the ascent of the arm 5 until the latter interlocks with the hook 7. During the upward movement of the lever 9 its stud 16 strikes against the end of a pivotally mounted lever 17 which, thereby, indirectly assists in actuating the front part *m* of the clutch coupling of the machine, in the following manner:—

The rear part of the coupling 18 is provided as represented in Figure 4 at a suitable point with a projection 19 which is connected by means of an articulated joint 20 with one end of a pivotted lever 22 the other end of which is controlled by a spring 21. This lever 22 is pressed downwards by the forward end of lever 17 referred to until its other end is caught and locked by a pivotted pawl 23. This movement of the lever 22 effects the turning of the clutch part 18 of the coupling device which thus becomes instrumental in driving forward the front part *m* whereby the working position of the capsule forming mechanism is obtained.

It is evident that to form the caps into capsules the mechanism must move forward. For this purpose the nave *d* on which the disc *c* is mounted is carried in a bearing 25 on a longitudinally movable support 24. The displacement is to take place only after all the operations described have been accomplished *i.e.* after the shaft support 11 has been pushed forward and the capsule forming mechanism has reached its working position. When all this is done, the pressing or forming rollers *g* and the whole forming mechanism is pushed forward for the purpose of pressing and forming the cap into a capsule. To this end the lower shaft 4 is provided with a loose belt pulley 26 connected by a strap 27 with a stepped pulley 28. On the nave or boss of the wormwheel 3 is pivotted a two-armed pawl 30 pressed downwards by a spring 29 and pressing with one end against a stud 31 on the pulley 26. As the wormwheel rotates, this combination of pawl 30 and stud 31 will involve the belt pulley in the rotatory movement in consequence of which the strap 27 which is fastened to the two pulleys will be tightened until the tension is sufficient to turn the stepped disc or pulley 28 which then effects the forward movement of the sliding support 24. This effect is obtained by the arrangement of a disc 31\* on the machine frame A the disc being connected with the said support or slide 24 by a belt or the like.

After finishing the capsule, the sliding support 24 returns to its initial position in the following manner. The wormwheel 3 carries a disc 34, retained laterally in position on the nave of the wormwheel 3 by a disc 33, and provided with a rising track 35. When the pawl 30, in passing over this track, reaches with its lower end its highest position, the other end of the spring controlled pawl 30 will release the stud 31 of the belt pulley 26, whereupon the support 24 will be withdrawn by a spring 36 to its initial position (Figures 4 and 5).

It is evident, that the machine may be employed for the production of capsules of any required length, and regulating devices are provided for that purpose, which are, however, not essential features as regards the principle of the invention.

If, for instance, it is required to produce short capsules, the machine, although otherwise working normally, will be allowed to work without effect for such length of time as corresponds to the difference in length between the longer capsules first produced and the shorter ones to be produced.

In order to compensate such decrease of output occasioned by the loss of time thus caused, the gearing which actuates the forming mechanism is made to work faster, *i.e.*, the driving belt is shifted on to a smaller circumference of the stepped driving pulley 1. In this manner the various phases of the work effected by the mechanism, follow each other more rapidly. It should, however, be borne in mind that, since the speed of the forward movement of the sliding support must always be the same, the strap 27 must be shifted on to a greater diameter of its



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stepped pulley 28. Thus, the speed, decided on, of the capsule forming mechanism 2, 3, *i.e.*, of the driving stepped pulley 1 must be accompanied by a change in the working diameter of the strap pulley 28 owing to the conditions which rule the speed of the forward movement of the sliding support 24.

5 In order to regulate the amount of pressure with which the cap Figure 10 is pressed against the mandrel *k* the locking plate 6 is so fixed on the arms 5 that its interlocking with the hook 7 can be effected sooner or later according to the requirements of the case, in consequence of which the shaft 4 and with it the crank 12 is turned through an angle which will vary correspondingly. For  
10 this purpose the plate 6 is simply moved upwards or downwards, according to the effect desired, for which purpose it is provided with a slot 37 and set screw 36\*, so that by adjusting it the point at which it is locked by the hook L can be varied. Nuts 38 secure the end of the stem of the plate 6 in adjusted position.

From the length of the capsule in each case depends also the releasing, at the  
15 required moment, of the pawls or hooks 23 and 7. This is effected by means of adjustable pins 39 and 40. If longer capsules are required, the pin 39 is placed, correspondingly, farther from the lower end of the pawl 23; while the release of the hook 7 from the arm 5 is effected by adjusting accordingly its corresponding pin 40, the latter pressing with its forward end against the sliding support 24  
20 and is moved backwards when the latter recedes in such a manner that the hook 7 releases the adjustable plate 6 on the arm 5.

Provision is also made for drawing the sliding support 24 more or less forward, by causing the strap pulley 26 and with it the stepped pulley to turn through a greater or lesser angle for every turn of the wormwheel 3. To do this, all that  
25 is required is to so adjust the disc 34 on the shaft 4 that the double armed pawl 30 is released, at the time required, from the stud 31 of the strap pulley. If, for instance, the disc 34 is turned say towards the right (Figure 3), the ascending track 35 will become farther removed from the rear end of the pawl 30 (considering the direction in which the wormwheel is turning). Since, however, the position of the pulley is always the same, as regards the relative position of the  
30 stud 31 and pawl 30, it is clear that more time will elapse from the time when the pawl 30 and stud 31 began to co-operate, until the pawl 30 is released by the passing of the stud 31 over the track 35.

For this turning of the disc 34 a screw-threaded rod 41 displaceable, relatively  
35 as regards the pin 39, is used, which is articulated by means of an arm 42, to the disc 34.

The working effect of the capsule forming mechanism and of the device for actuating the same may be briefly described as follows:—

In consequence of the movement of the wormwheel device 2 and 3 the arm 5 is  
40 turned with the shaft in the manner described by the lever 9 until it is interlocked with the hook 7. During this time the upper spindle *e* has travelled towards the mandrel *k* until it presses against the latter, or rather, against the cap placed on it, and set in rotation. The ascent of the lever 9, however, has also been followed by the displacement of the front part *m* of the coupling device  
45 in consequence of its action on the lever 17 and the forming or pressing rollers are pressed against the mandrel *k*. A moment later the pawl 30 comes in contact, as the movement of the wormwheel continues, with the stud of the strap pulley 26, and the sliding support 24 is consequently drawn forward for the purpose of forming the capsule Fig. 11.

50 The return movement to the initial position of the various parts, is effected in the reverse order. After the coupling part *m* is pushed backwards, in consequence of the pawl 23 striking against the pin 39 whereby the finished capsule is released from the rollers *g*, the other pawl 30 is disengaged from the stud 31 of the strap pulley 26 whereupon the sliding support 24 is free to be drawn back  
55 by its spring 36. At the same time the arm 5 is released from the hook 7 and a spring 42<sup>1</sup> by turning the shaft, and with it the crank 12 in the reverse direction, returns the support 11 to its initial position. Thereby the upper spindle or



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shaft *e* is also withdrawn from the mandrel *k* and the finished capsule is thrown off by a sharp forward movement on the said mandrel *k* of a sleeve 43 thereon.

Finally it may be observed here, that, as represented in Figures 4 and 5, the coupling member *m* is connected to a suitable guide device 44, in order to keep it from rotating, but allowing it to move longitudinally along the hub of the disc C when the clutch member 18 is turned.

Having now particularly described and ascertained the nature of this said invention, and in what manner the same is to be performed, I declare that what I claim is:—

1. A capsule forming device comprising a series of spindles such as *i*, arranged between two discs the front one of which carries supports for the capsule pressing rollers and longitudinally displaceable spindles such as *l* spiral springs on the former set of spindles tending to draw back from the mandrel upon which the capsules are formed a series of forming rollers suitably mounted on said supports while the rollers are pressed towards the mandrel when the second set of spindles and with them the rollers are pressed forward levers being provided between the said spindles and the ends of the roller supports to effect said movement substantially as described.

2. A device for automatically actuating the capsule forming mechanism comprising a lever such as 9, actuated by wormwheel mechanism which lever displaces a support such as 11 and with it a spindle such as *e* for the purpose of fixing on the mandrel a cap placed on it while by means of a lever 17 and a locking lever 22 a coupling member *m* is moved forward for the purpose of placing the pressing rollers in operative position substantially as described.

3. In a machine of the kind described a disc such as 34, on the nave of the wormwheel loosely arranged on its shaft said disc being provided with an inclined track for a double armed pawl such as 30 in order to interrupt when the capsule is completed the rotation of a strap disc such as 26 owing to the engagement of said pawl with a stud on said disc and to liberate the sliding support by disengaging the pawl from the stud and to bring back the said support to its initial position substantially as described.

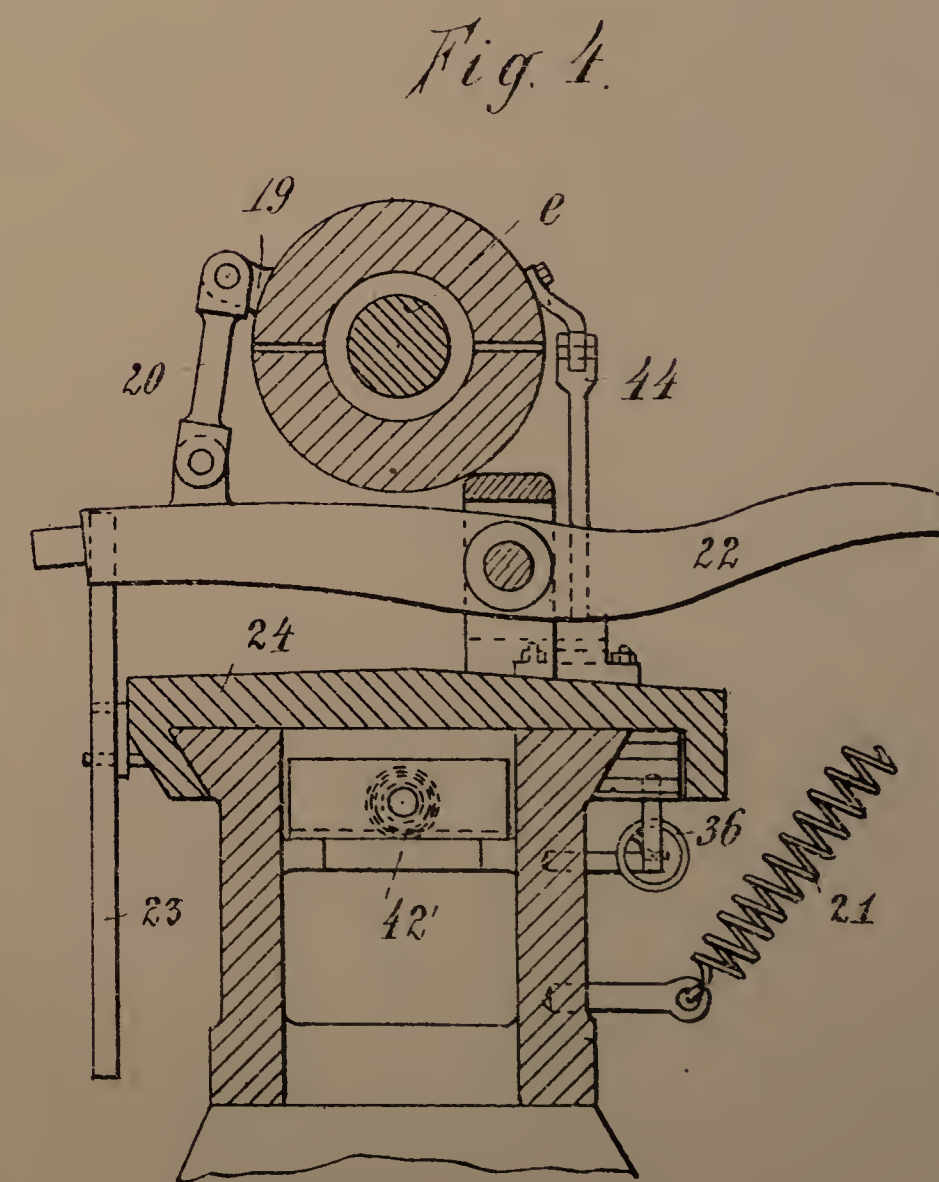
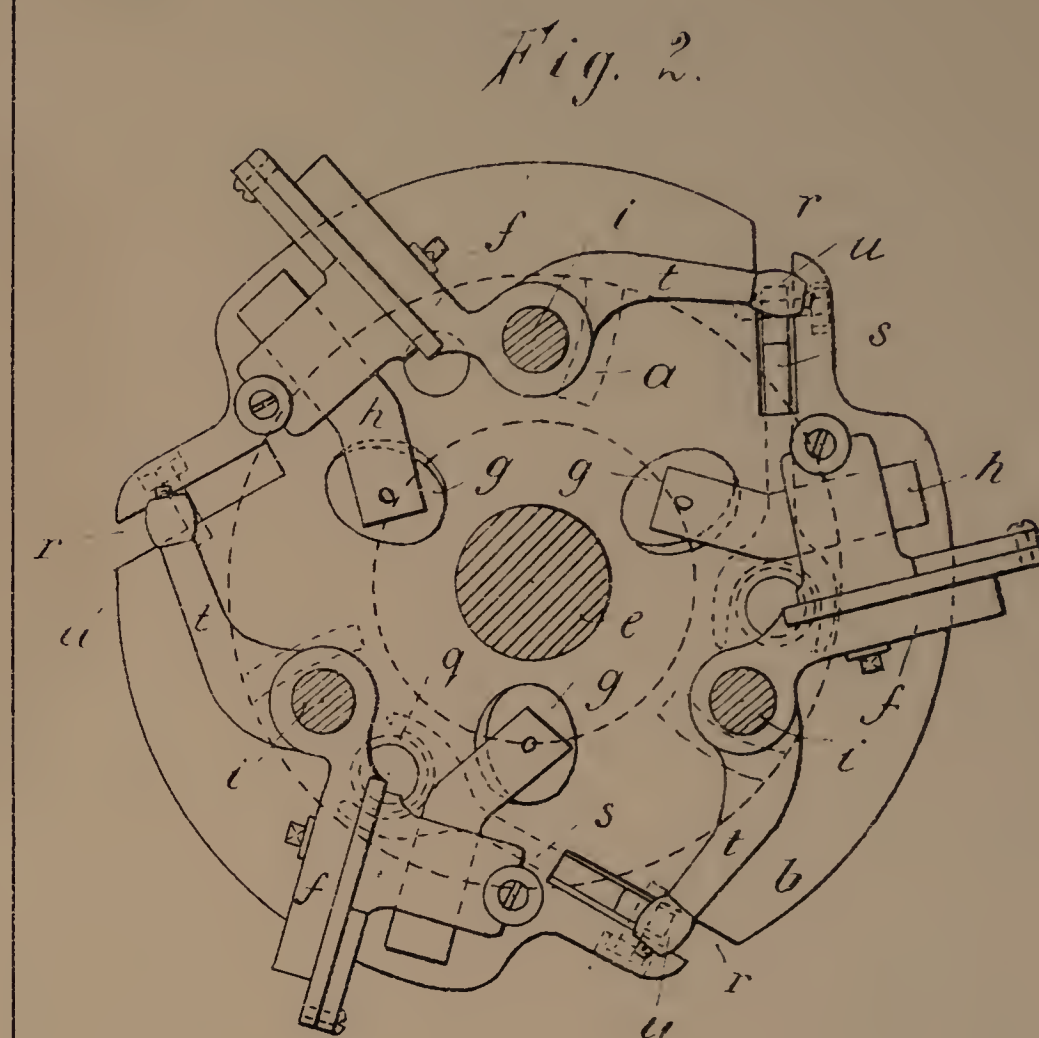
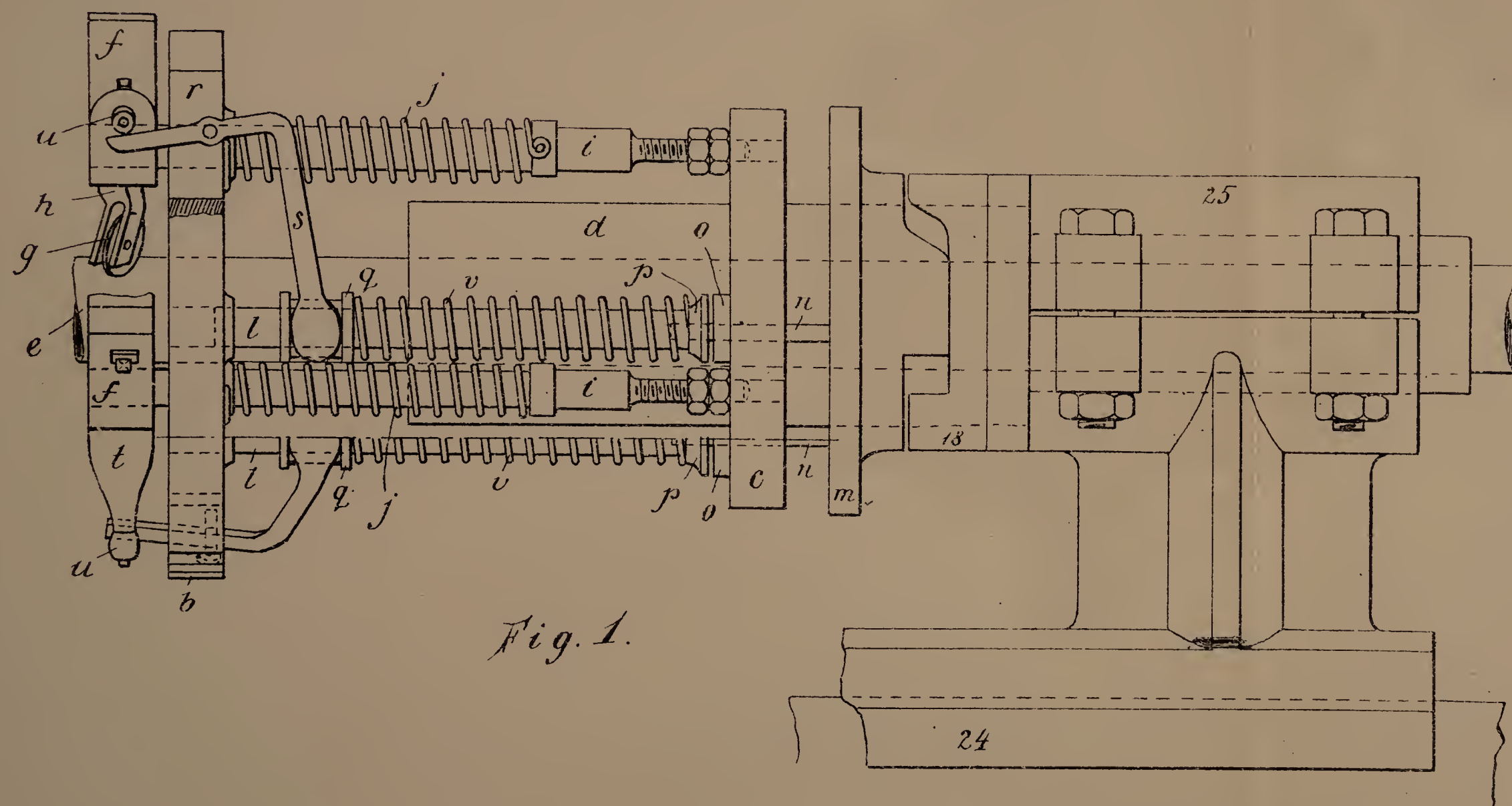
4. The complete capsule forming apparatus substantially as described or illustrated in the accompanying drawings.

Dated this 29th day of July 1901.

BOULT WADE & KILBURN  
Agents for the Applicant.







[This Drawing is a reproduction of the Original on a reduced scale.]







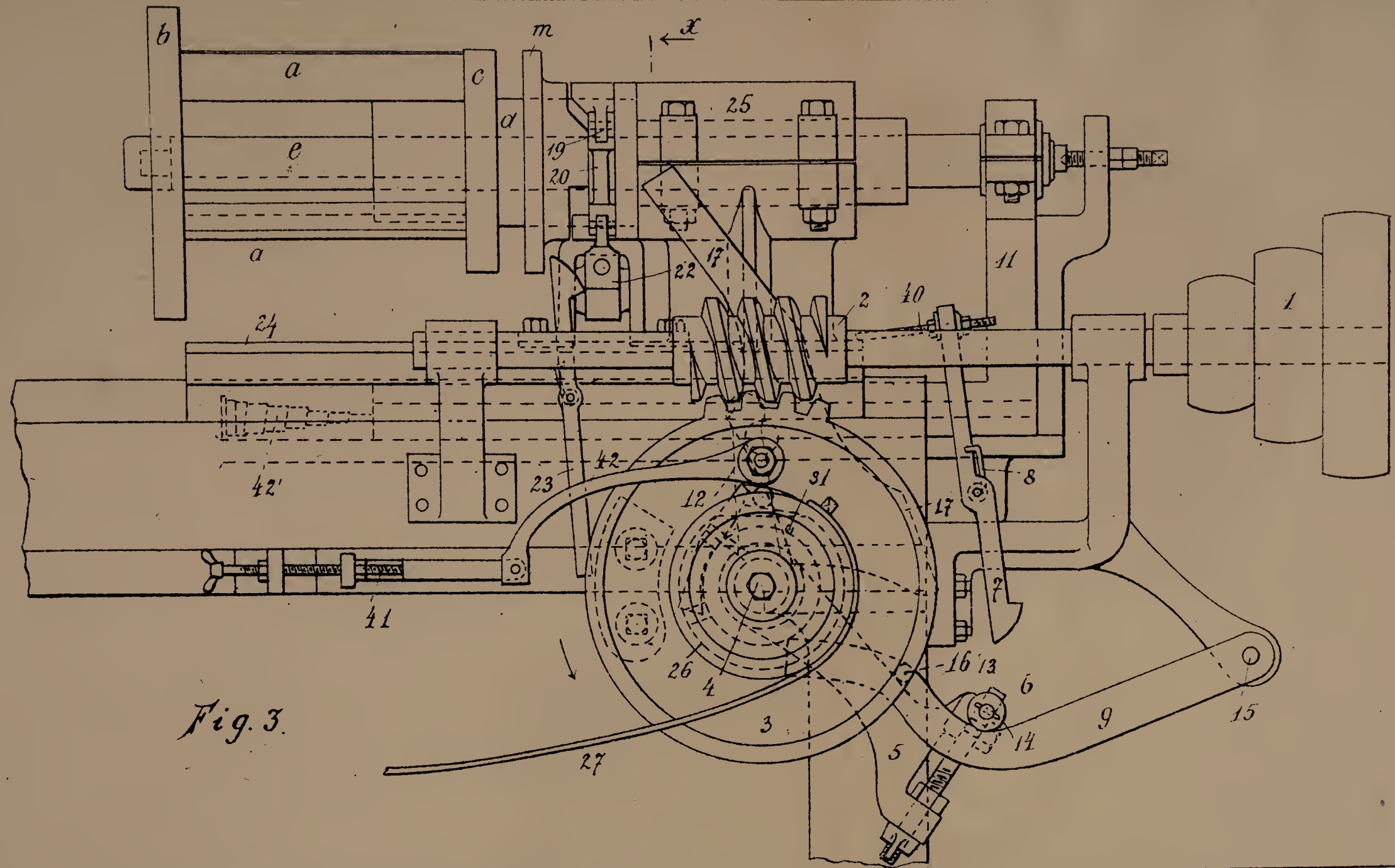


Fig. 3.

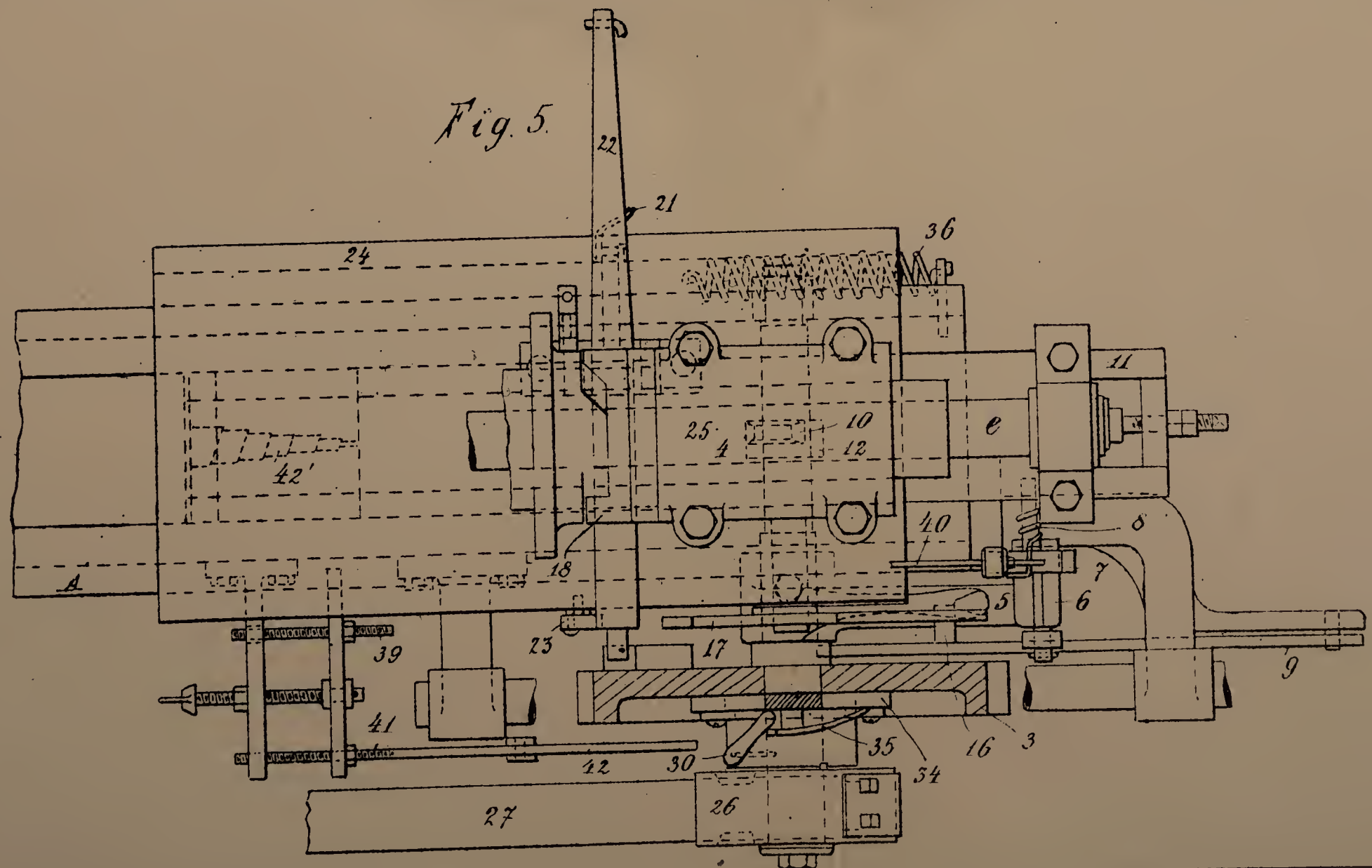


Fig. 5.

[This Drawing is a reproduction of the Original on a reduced scale]







Fig. 8.

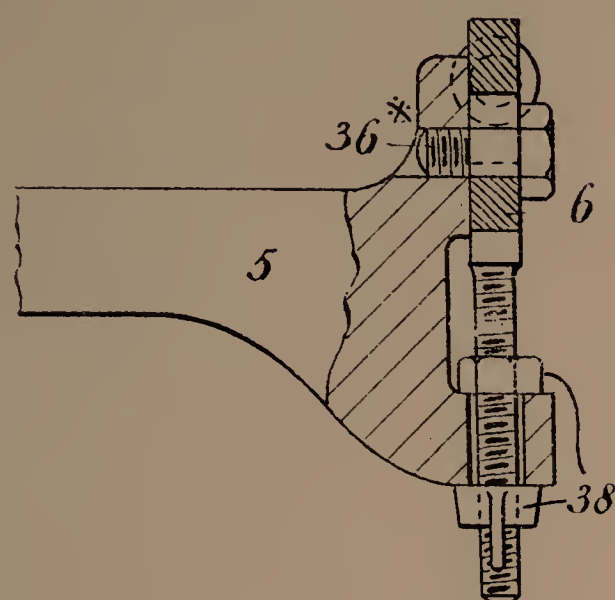


Fig. 9.

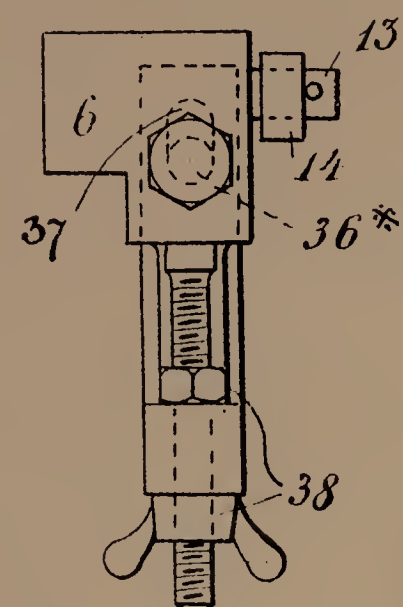


Fig. 10.

Fig. 11.

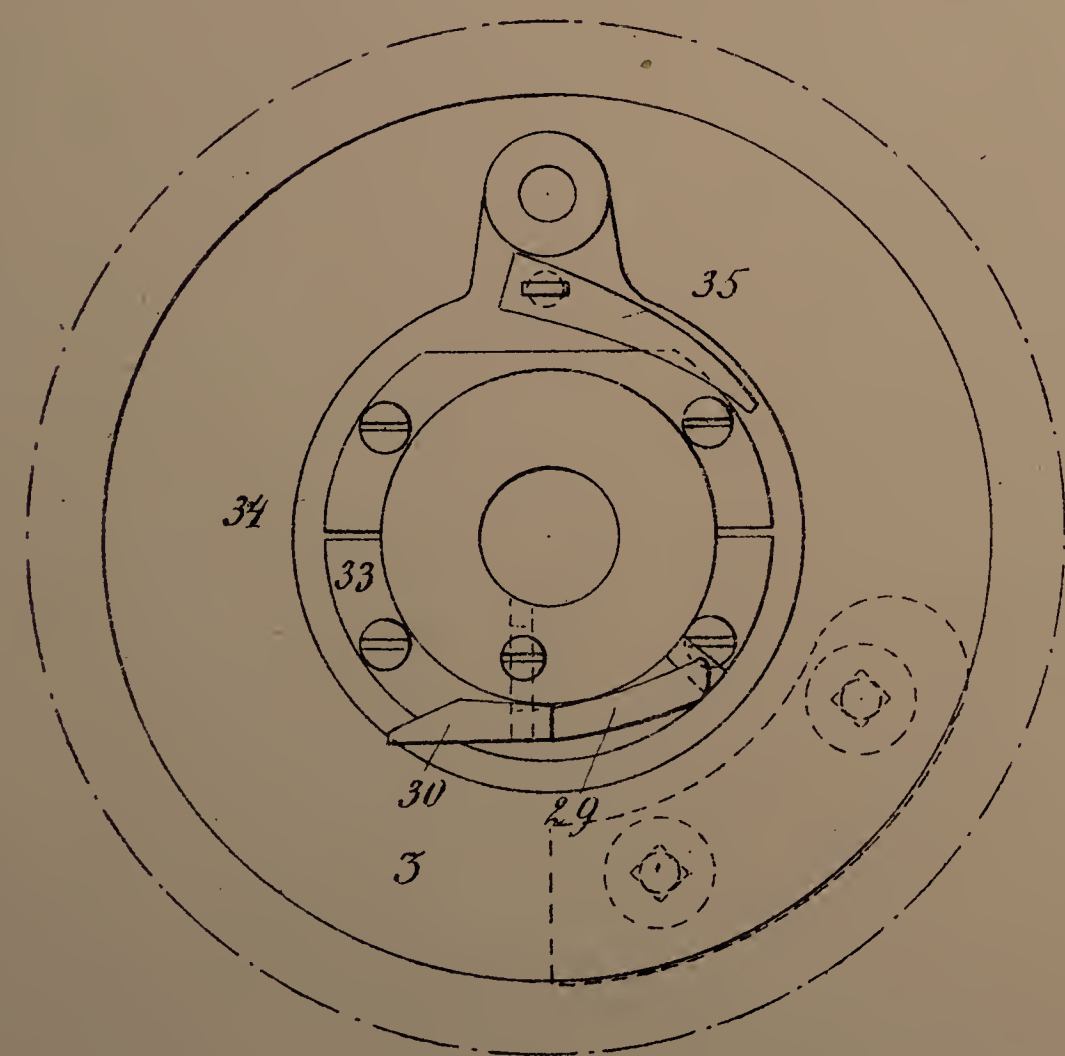


Fig. 6.

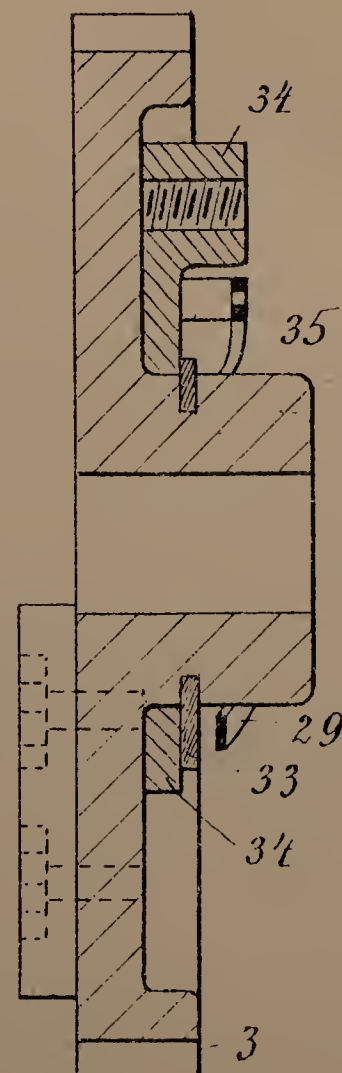
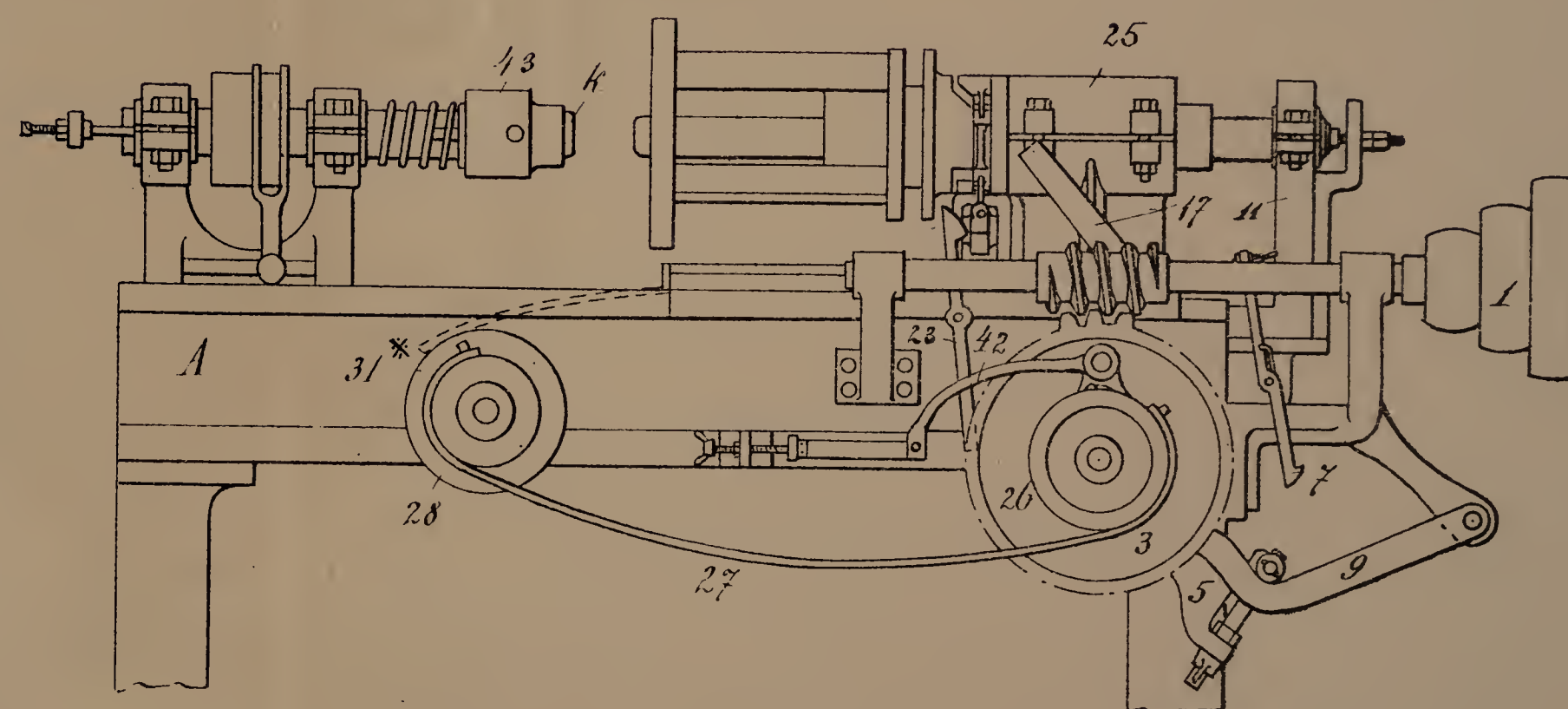


Fig. 7.

Fig. 12.



[This Drawing is a reproduction of the Original on a reduced scale]



